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Jeffrey Kwan  
Energy Division  
California Public Utilities Commission  
505 Van Ness Ave.  
San Francisco, CA 94102

Mr. Kwan and Energy Division Staff –

The California Solar Energy Industries Association (CALSEIA) appreciates the opportunity to comment on *Staff Proposal on Reactive Power Priority Settings of Smart Inverters* (Staff Proposal), issued at the California Public Utilities Commission (Commission) on July 27, 2017.

The ability of distributed inverters to regulate voltage on the distribution system will be a major step forward in the transformation of the electric grid from an antiquated, centralized system to a modern, distributed system. Solar and storage providers are excited at the prospect of performing services that were previously managed solely by utilities.

Inverters with Volt/Var capabilities and active power priority will soon provide reactive power support for grid benefit. When solar systems are not generating power at full capacity (i.e. outside of the middle of the day in the middle of the summer), the inverter can handle both solar production and reactive power support. This will address a large portion of the voltage support needs of distribution feeders once high penetrations of these inverters are installed.

Providing greater predictability that the capability will be available to the distribution system when it is needed presents a tension between customers and utilities. Setting inverters with Volt/Var capability to reactive power priority can ensure that a certain amount of functionality will always be available, but it has the potential to reduce power production or increase system costs.

Rule 21 governs the interconnection of distributed energy resources, including mitigation for impacts caused by such individual interconnections. It is true that individual solar systems can cause increases in voltage in the circuit segment where the solar system is interconnected, but that impact is small. A power factor setting of +/- 0.98 would be enough to address an individual system's impact on the distribution circuit.

The Staff Proposal notes that Volt/Var functionality with reactive power priority is required for interconnection in Hawaii. However, the capability in Hawaii is only for power factor adjustment of +/- 0.95, and one would expect the need to be greater there giving the higher penetration of solar.

As revised in accordance with recommendations of the Smart Inverter Working Group (SIWG), Rule 21 requires that inverters be *capable* of adjusting power factor in a range of +/- 0.85 for systems larger than 15 kW. Using this full technical capability would provide services to the grid beyond addressing an individual system's impact on the distribution circuit.

The need for these services may not be evident at the time of interconnection and could change over time. Thus, customers would not know whether they could expect full production from a solar system.

To design a system that does not limit power production while providing reactive power support, a customer would have to increase inverter size. This would increase costs.

The requirement would be especially burdensome and limiting for residential systems that have limited flexibility due to their smaller scale, and would likely result in smaller systems being interconnected. The maximum system size of a solar system is often based upon the continuous output rating of the inverter in comparison with the size of the main service panel. If the DC-AC ratio is decreased by oversizing the inverter, fewer solar panels would be allowed even though the larger inverter would not have resulted in more generation. For example, in a home with a 200-amp service panel, the allowable interconnection ampacity, based upon National Electric Code 705.12(D)(2), would generally be 40 A of interconnected breakers and 32 A of continuous inverter output circuits. If the inverter is oversized by an additional 15%, then the maximum system size in DC will be reduced by 15%.

This policy also requires that slightly larger inverters are available. While that may be feasible for string inverter and central inverter systems, the existing microinverter products and AC-module products on the market are sized to maximize output of the existing DC modules' nameplate ratings. New products would need to be developed to meet new requirements. That can be done, but the Commission must allow time for it to happen.

For many systems, there is often 1% to 2% voltage rise between the Point of Common Coupling (PCC) and the inverter output terminals. If an inverter needs to respond to a 3% voltage deviation at the terminal, it would be addressing an excursion of less than 3% at the PCC.

In cases where there are hosting capacity limitations, customers often design systems with a high DC-AC ratio (i.e. increasing the PV size with respect to the inverter size) in order to increase the number of hours in which the system can operate at the maximum allowable generation level. In those cases, oversizing the inverter is not an option and reactive power priority would reduce the system's power production.

Throughout the discussions of the SIWG leading to the technical standard for inverter capability, it was understood that development of compensation mechanisms would

happen prior to power factor adjustment becoming mandatory. The issue of compensation was raised in many SIWG meetings, and the response was always that compensation is outside of the scope of the SIWG but that the development of compensation mechanisms would happen before the use of smart inverter capabilities that significantly impact real power production become mandatory. The Commission has failed to initiate that discussion. To make usage of the functionality mandatory to the full extent of the technical standard without even beginning the compensation discussion brings into question the collaborative, good-faith nature of the SIWG process.

At the very least, the Commission should harmonize mandatory functionality with IEEE 1547. The draft revision to that standard requires power factor adjustment of approximately  $\pm 0.90$ . This would require revising the standard that is already in Rule 21 for technical capability of inverters, but the Commission should find such a change to be acceptable. The initial standard in Rule 21 was stronger than the likely outcome of IEEE 1547 and needs to be reduced in order to harmonize, but ultimately California has forced IEEE 1547 into action. That is a sign of strength, not weakness.

The IEEE 1547 committee is currently working through comments on the proposed update to the standard and expects to have a final revision by the end of the year. The Commission should indicate it will adopt a standard that is equivalent to IEEE 1547 and make it mandatory one year after the IEEE 1547 update is finalized.

At the same time, the Commission should renew the scope of R.14-10-003 to begin debate about market mechanisms to enable grid services. As a starting point for that discussion in the context of reactive power support, IOU rate schedules for large commercial customers already have power factor adjustments. If customers have large motor loads that absorb reactive power, utilities must install capacitors that produce reactive power. This is a function that has been valued per unit of capability. For example, SCE's Schedule TOU-8 includes a charge of \$0.55/kVAR for customers with power factors outside of a normal range.

CALSEIA does not know if that is the right value for voltage support from advanced inverters, but it is a place to start the discussion. A per-kVAR rate could be implemented relatively quickly. Existing interval meters should be able to measure reactive power injection and absorption. An opt-in mechanism could be appropriate, and customers that do not expect large amounts of power loss may not opt into a compensation mechanism because it may be more trouble than it is worth. Third parties such as inverter manufacturers could provide the service of monitoring reactive power and notify the customer if it is significant enough to justify compensation.

Solar providers want their customers to be good grid citizens. We understand that the systems we install have capabilities that are valuable to the grid and want to be part of solutions. However, we also want the Commission to stay true to its long-standing commitment to considering compensation mechanisms before changing advanced inverter standards from capabilities to operating requirements.

CALSEIA's recommendation at this time is to harmonize with IEEE 1547 and give customers one year from the adoption of the updated standard to comply. This position represents CALSEIA's initial thinking on the subject for purposes of informal comments. More detailed analysis would be needed if there were a formal proposal to change the default setting of the Volt/Var setting to reactive power priority. CALSEIA is also open to discussing other pathways that encourage more robust usage of Volt/Var functionality without severely disadvantaging certain customers and manufacturers.

Respectfully,

/s/ Brad Heavner

Brad Heavner  
Policy Director